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June 14, 2006

**By E-Mail (airworkgrouphr@dep.state.nj.us) and U. S. Mail**

Laura Scatena
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***Re: COMMENTS ON WHITE PAPERS REGARDING OUTDOOR WOOD BOILERS OR FURNACES ("OWFs")***

Dear Ms. Scatena:

This firm represents Central Boiler, Inc. ("Central Boiler") which has asked us to submit the following comments on the white papers issued by the Work Group relating to OWFs

Central Boiler is one of the largest manufacturers of outdoor wood furnaces in the nation. In 2004, Central Boiler manufactured approximately one-third of the OWFs sold in the United States. OWFs offer a natural, efficient approach to heating. Even before the latest round of energy price increases, homeowners, small businesses and farms relied on OWFs as a cost-effective heating alternative. Today, OWFs offer even greater cost-savings as a result of the escalating cost of home heating oil, natural gas and electricity. When properly sited and operated (and dealers and customers are carefully instructed by Central Boiler in proper siting and operation), they are also a clean, renewable energy source.

**Emissions from OWFs are Similar to Emissions from USEPA Certified Wood Stoves**

The May 2, 2006 White Paper indicates that emissions from OWFs are significantly greater than from indoor wood stoves and have the potential to become a significant source of particulate matter (PM) emissions. Nationwide figures show OWFs constitute only 0.2% of all residential wood appliances.[1] Thus, to the extent that there is a concern regarding particulate emissions, the emission of particulates from OWFs are very small in comparison to emissions from wood stoves and fireplaces.

Moreover, a well-designed and properly installed OWF has essentially the same PM emissions as an EPA-certified wood stove and far less PM emissions than wood stoves that are not certified by EPA and open fireplaces. Both wood stoves and OWFs are bulk-loaded with cordwood. In both, the combustion processes are regulated by an air damper (manual in a wood stove, automatic in an OWF), and heat transfer is through the firebox surface to either the surrounding room (in the case of a wood stove) or a surrounding water reservoir (in the case of an OWF).

The usable heat produced by a stove or furnace is related to the quantity of wood burned; thus, an appropriate measure of emissions is grams of PM per kilogram of fuel burned (g/kg, dry basis), or grams of PM per megajoule of output heat (g/MJ). Either metric allows a meaningful comparison of emissions from stoves and furnaces.

EPA test data for actual home use of certified Phase II wood stoves show that they emit an average of 9.7 g/kg (dry basis).[2] EPA test data for actual use of a well-designed OWF demonstrate an average emission rate of 9.35 g/kg (dry basis)[3].

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[1] EPA, "Residential Wood Combustion Technology Review, Volume 1," EPA-600/R-98-174a, December 1998, pp. 3, 10, 16 and OWF Data from Central Boiler, Inc.

[2] EPA, "Long-Term Performance of EPA-Certified Phase 2 Woodstoves, Klamath Falls and Portland, Oregon, 1998-1999," EPA-600/R-00-100, November 2000, p. 43, Table 3-9. Individual stoves emitted up to 20.8 g/kg in the EPA tests. Note that EPA emission factors in publication AP-42 (7.3-8.1 g/kg) are estimated from tests done in 1992 that were then scaled to the EPA certification method which does not represent actual in-use emissions. The un-scaled 1992 field measurements on Phase II certified stoves in Crested Butte reveal actual PM emissions of 9.9-12.8 g/kg.

[3] EPA, "Emissions From Outdoor Wood-Burning Residential Hot Water Furnaces," EPA-600/R-98-017, February 1998, p. 26, Table 4-1a, average of Furnace B/B-3 and B-4 test results, Central Boiler, Inc model CS17.

Actual in-use emission rates are essential to a proper comparison between stoves and OWFs since it is an established fact that the certification limits for wood stoves do not represent actual emissions (see discussion at the end of this section). The wood stove emission rate of 9.7 g/kg is the average of 43 EPA tests on 16 certified wood stoves as they were actually operated in people's homes, and where necessary the stoves were repaired to proper working condition prior to the tests. The OWF emission rate of 9.35 g/kg is the average of 2 EPA tests of a well-designed OWF, fueled with oak cordwood and with the damper air control run by a thermostat tied to a typical winter residential heating load so that OWF operation cycled on and off, matching actual in-home use. **Both woodstove and OWF actual emissions are approximately 10 g/kg (dry basis); assuming 50% efficiency, equivalent to 1.1 g/MJ.**

Thus, particulate emissions from OWFs are similar to those of EPA-certified wood stoves (and less than particulate emissions from non-certified wood stoves or fireplaces).

It should also be noted that actual in-use EPA certified woodstove emissions are higher than emissions during EPA certification tests, for several reasons. Here are two quotes from EPA publications on the subject:

- "Wood stoves are designed out of necessity to pass the EPA certification test. It is generally recognized these tests do not simulate the way that a stove is used in the real world... A technician, skillful in manipulating parameters within the specifications of Method 28, can influence test results significantly."[4]

- "It is generally felt that the low burn rate and five-minute startup procedure in Method 28 are 'artificial' in that stoves are not used in homes in a manner that approximates Method 28 low burn rate and start-up procedure. The other major comment is that stoves are designed to produce low emissions while burning dimensional lumber with fixed spacing, not cordwood loaded in a stove in a 'normal' fashion."[5]

The air control manipulations done in a certification test, crucial to a wood stove passing the EPA certification, are not done by homeowners. When a stove is refueled in the home, the wood is added, the air control might be adjusted, and the homeowner walks away. He or she does not come back 5-15 minutes later to readjust the air controls, and does not repeatedly manipulate them for low

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[4] EPA, "Residential Wood Combustion Technology Review Volume 1," EPA-600/R-98-174a, December 1998, pp. iii, 8 and 34.

[5] U.S. EPA, "Residential Wood Combustion Technology Review, Volume 2, Appendices," EPA-600/R-98-174b, December 1998, pp A-39, A-73 and A-82.

emissions performance. Thus, actual in-home use of a wood stove produces substantially higher emissions than the EPA certification limits suggest.

**Properly Installed OWFs Should Not Cause Exceedences of NAAQS for Particulates**

With respect to outdoor air quality, a properly installed OWF should not cause violations of National Ambient Air Quality Standards (NAAQS) for $PM_{10}$, established to protect public health with a margin of safety. The 24-hour NAAQS for $PM_{10}$ is 150 $\mu g/m^3$. Using data from the EPA tests on a well-designed OWF, dispersion modeling with EPA's SCREEN3 model was performed for a continuously-operating OWF installed in two potential locations: 1) close to a house (subject to building downwash effects), and 2) at a distance five times the roof height (no downwash effects).

Following Central Boiler's installation instructions for its product, the stack height was set equal to the roof peak of the house. The predicted maximum $PM_{10}$ concentrations, scaled to a 24-hour period using EPA conservative time scaling factors, are 38 $\mu g/m^3$ and 3 $\mu g/m^3$ for the downwash and no-downwash scenarios, respectively. When the stack height is short relative to the roof peak, however, much higher concentrations (and complaints from nearby neighbors) can result. This analysis demonstrates that a properly designed OWF, installed in accordance with Central Boiler recommendations, produces even localized $PM_{10}$ concentrations that are well within the NAAQS.

**OWFs Provide Significant Advantages Over EPA-Certified Wood Stoves**

While the PM emissions from OWFs are similar to EPA-certified wood stoves, OWFs provide important advantages over wood stoves:

- Most indoor wood stoves use heated indoor home air as their combustion air which must be replaced by outside, colder air, thus reducing efficiency. Indoor stoves also draft indoor heated air out of the home even when not in use, reducing efficiency even further.

- Wood stoves produce hot and cold spots in a home, because they are not thermostatically controlled like an OWF that feeds hot water to a central heating system and distributes the heat effectively to the entire home. As a consequence, indoor wood stoves create excessive heat loss from the home compared to OWF systems. In addition, to heat an entire home, more than one wood stove may be needed.

- Indoor wood stoves adversely affect indoor air quality, the primary exposure for people to wood smoke, because there are always some wood

combustion byproducts (smoke) that are present in the home as a result of operating, maintaining, and refueling these stoves. By contrast, an OWF removes the combustion process to outside the home which eliminates this exposure from indoor wood burning.

- Over the period from 1980-1998, indoor wood burning was responsible for 1,541,800 fires; $1.024 billion in property losses; and 3,275 deaths. (NFPA Fire Analysis & Research, *U.S. Home Heating Fire Patterns,* June 2001).

**Neighbor Complaints**

Central Boiler supports the "Best Burn Practices" developed by the OWF industry (copy enclosed with this letter) which requires that new OWF installations located within 100 feet of an adjacent or nearby residential structure (on property not served by the OWF) include a chimney height which is not less than the height of the roof-line of the adjacent or nearby residential structure (a diagram depicting this recommendation is also enclosed with this letter). In this way, the chief complaint cited by those that assert that an OWF is creating a "nuisance" condition can be mitigated by an appropriate chimney height that promotes dispersion of smoke (in the same way that smoke from a woodstove or fireplace is dispersed) and prevents "downwash" and other related effects that could lead to neighbor complaints.

Very truly yours,

Philip H. Gitlen

PHG/lbr
Enc.

cc: Rodney Tollefson
David McDonald

## OUTDOOR FURNACE BEST BURN PRACTICES

1 Read and follow all operating instructions supplied by the manufacturer

2. **FUEL USED:** Only those listed fuels recommended by the manufacturer of your unit Never use the following: trash, plastics, gasoline, rubber, naphtha, household garbage, material treated with petroleum products (particle board, railroad ties, and pressure treated wood), leaves paper products, and cardboard.

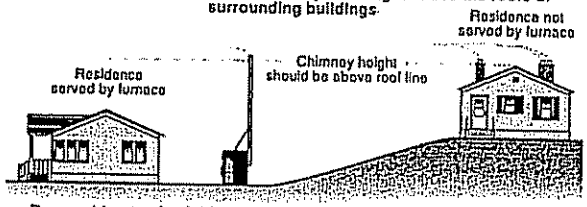
3. **LOADING FUEL:** For a more efficient burn, pay careful attention to loading times and amounts.

4. **STARTERS:** Do not use lighter fluids, gasoline, or chemicals.

5 **LOCATION:** It is recommended that the unit be located with due consideration to the prevailing wind direction

### Chimney Height Installation Scenario

When installing a furnace within 100 feet of buildings not serviced, it is recommended to extend the chimney to a height above the roofs of surrounding buildings.




Be considerate of neighbors when operating your furnace. If you use your furnace in the summer months, be certain your chimney exhaust is not adversely affecting neighbors with open windows.

6 Always remember to comply with all applicable state and local codes

HPBA
Hearth, Patio & Barbecue Association

Outdoor Furnace Manufacturers Caucus

# Chimney Height Installation Scenario

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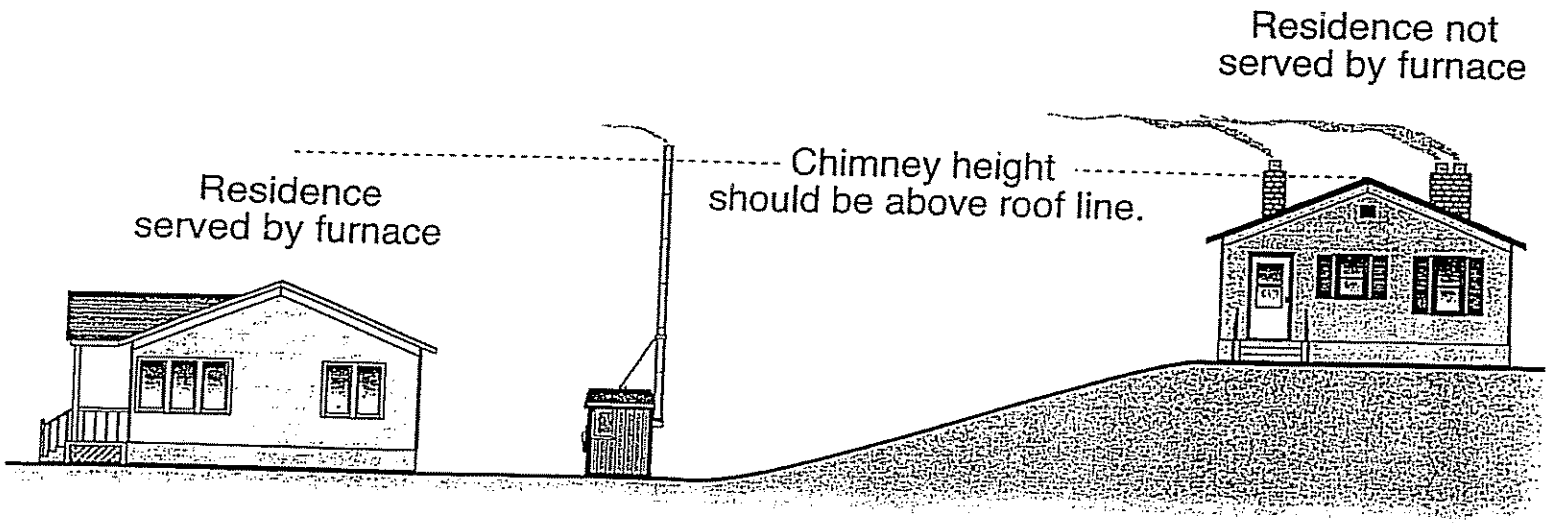


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